Benefits and consequences of managin Haringvlietsluices for fish migration

Kees Storm
Rijkswaterstaat, South Holland Department

LACPR Workshop field trip

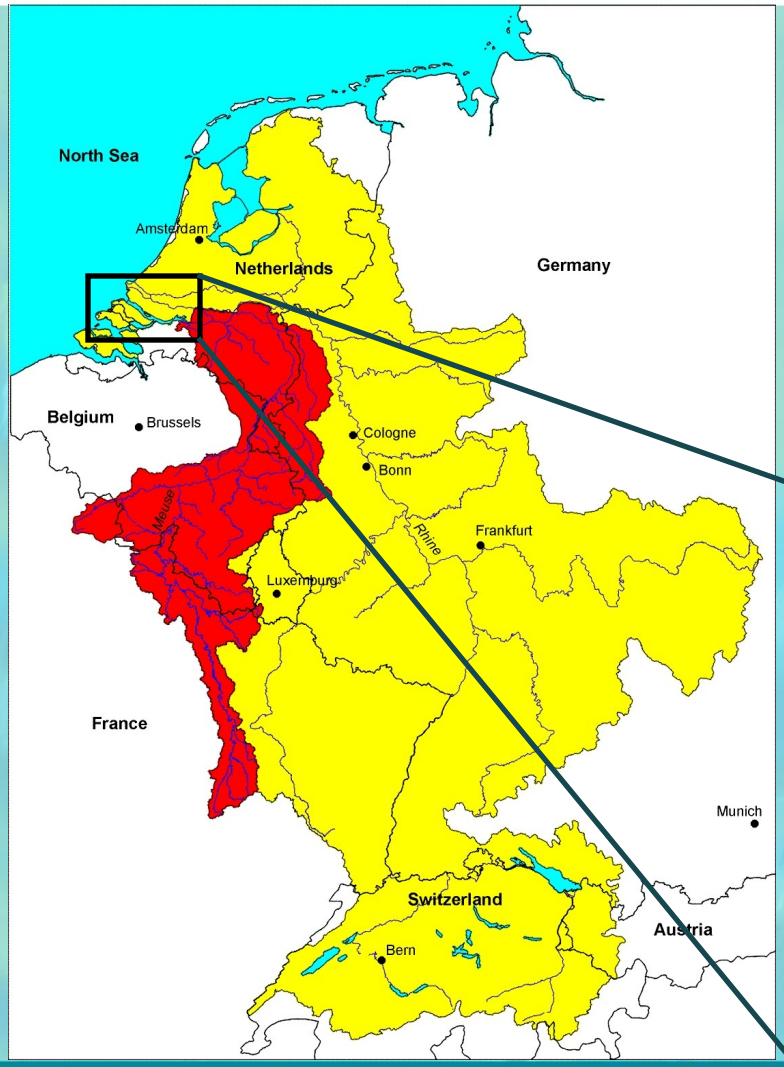
July 12th 2006

Overview of the presentation

- Intro Rhine-Meuse estuary & Haringvlietsluices
- Environmental Impact Assesment
- Alternative management of the sluices
- Conclusions

Haringvliet & Hollandsch Die

Rhine & Meuse Rivers



Basin 120.000 km2

Average discharge

- **Rhine 2200 m3/s**
- **Meuse 230 m3/s**

Delta 40.000 km2

50% below sea level

3 water bodies:

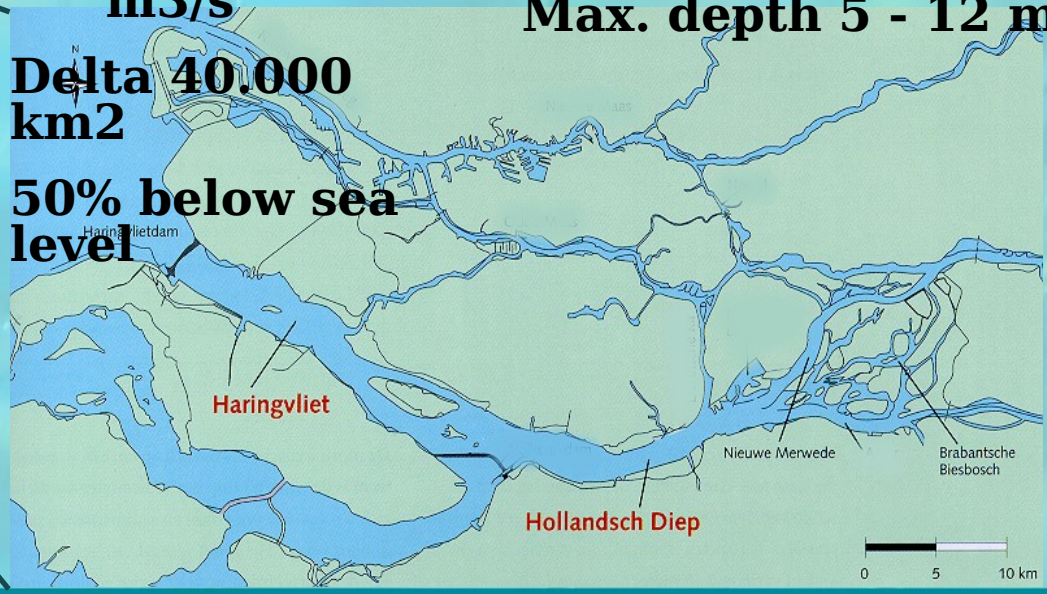
Haringvliet (80 km2

Hollandsch diep (38 km2)

Biesbosch (10 km2)

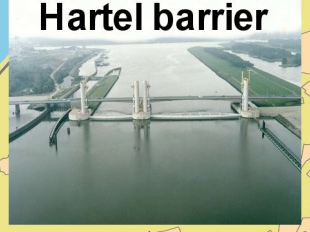
Total length 64 km

Max. depth 5 - 12 m



Maeslant storm surge barrier
1997

Hartel barrier



Haringvliet sluices
1970

Algerabarrier
1958

ROTTERDAM

Grevelingen dam
1971

HARINGVLIET

GREVELINGENMEER

HOLLANDSCH DIEP

Oosterschelde storm surge barrier
1985

OOSTERSCHELDE

VLISSINGEN

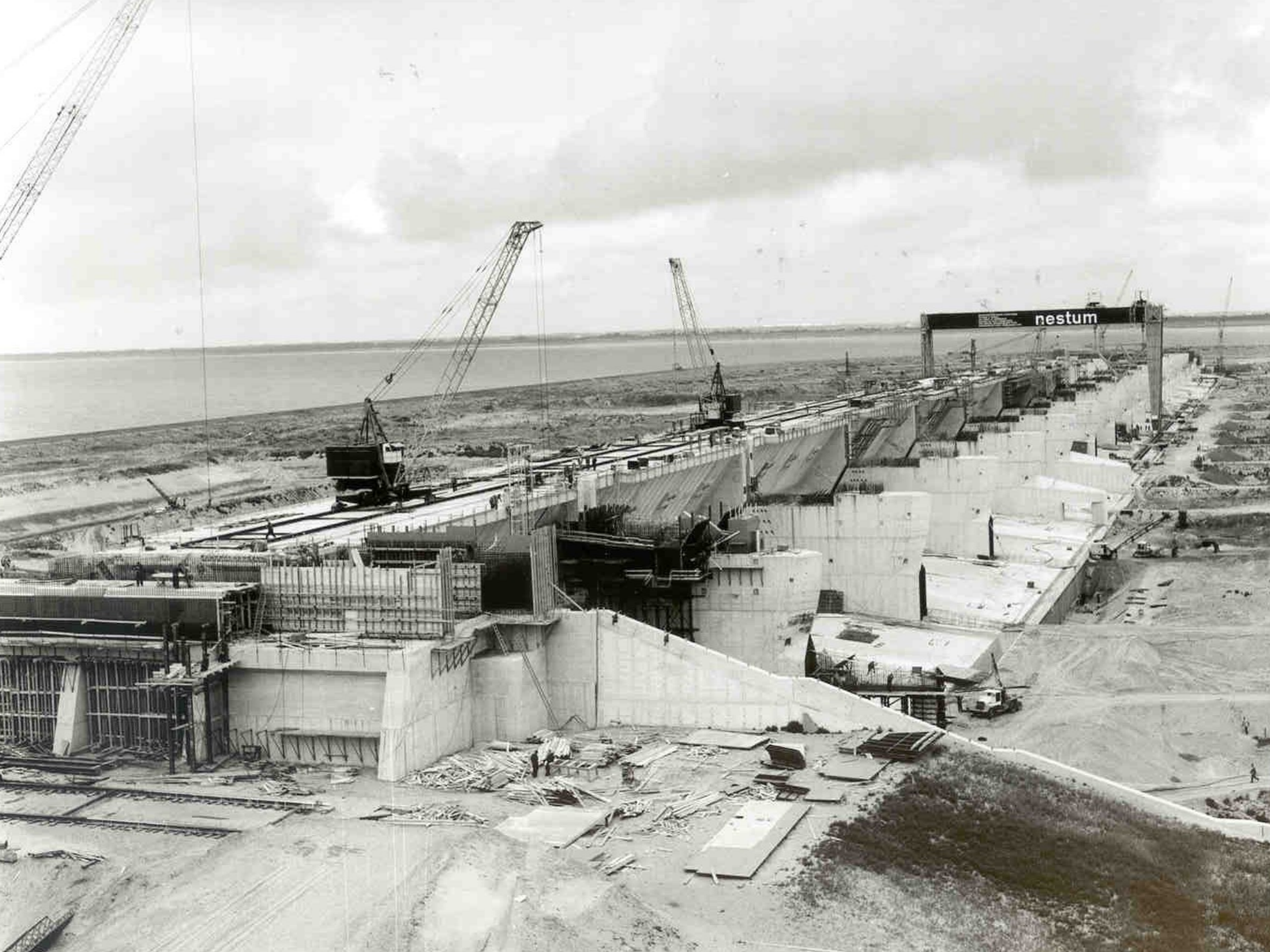
WESTERSCHELDE

NORTHSEA

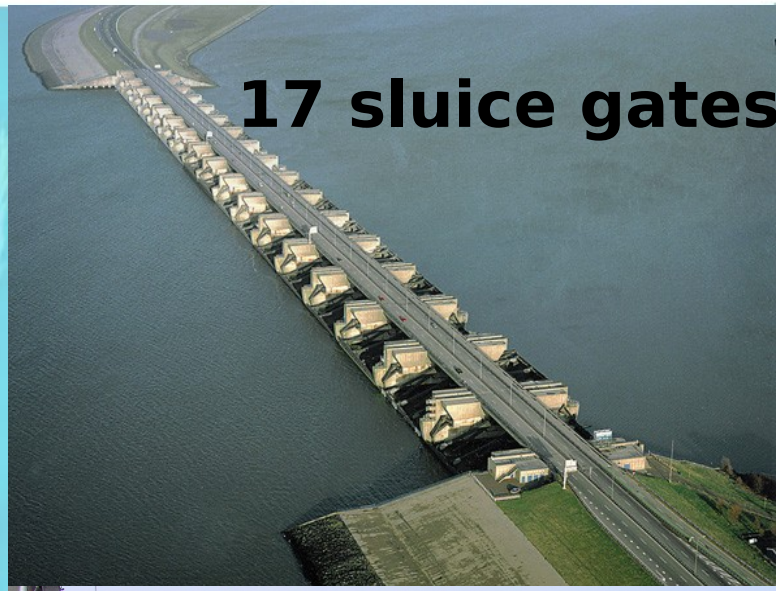
N

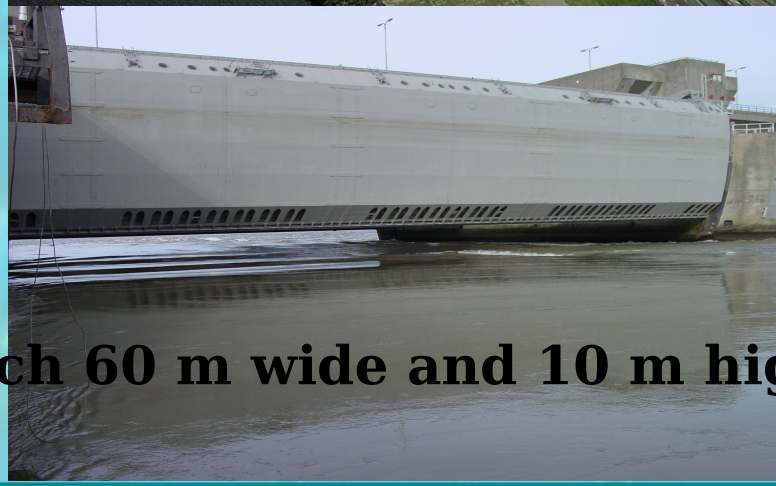
0 10 20 Kilometers

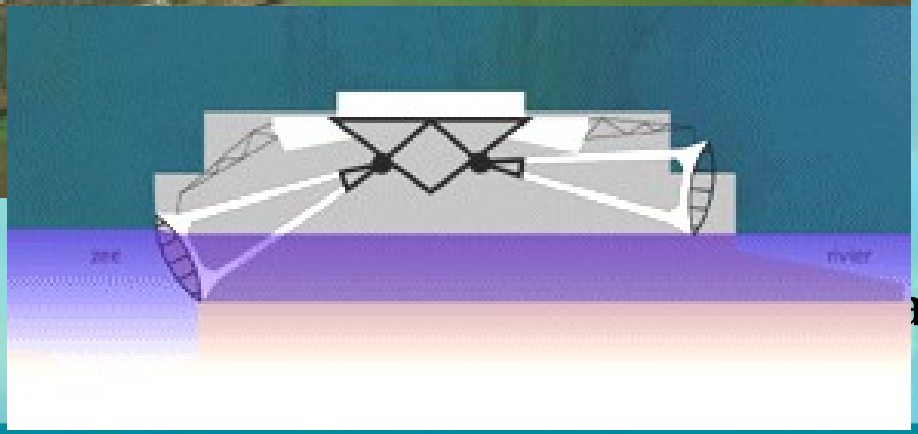
The anwser: the Delta Project (1958-1997)


nestum

and the Haringvlietsluices (1970)





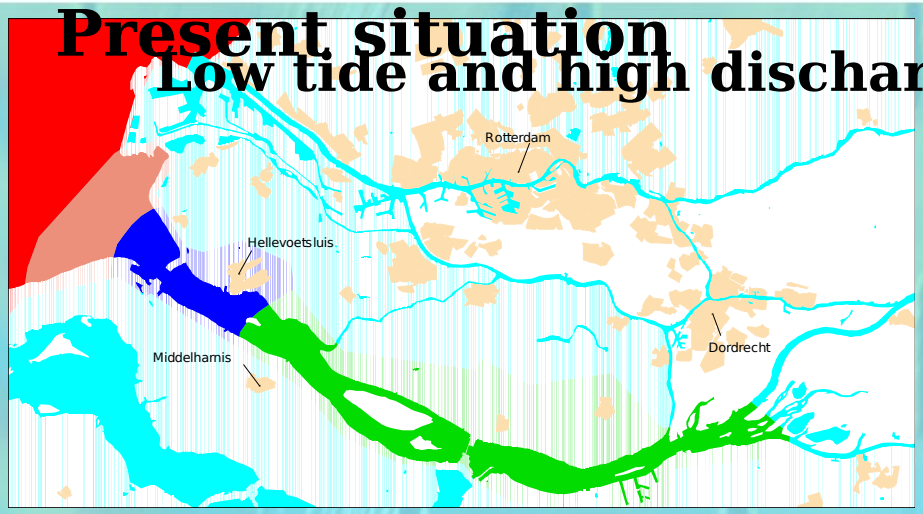


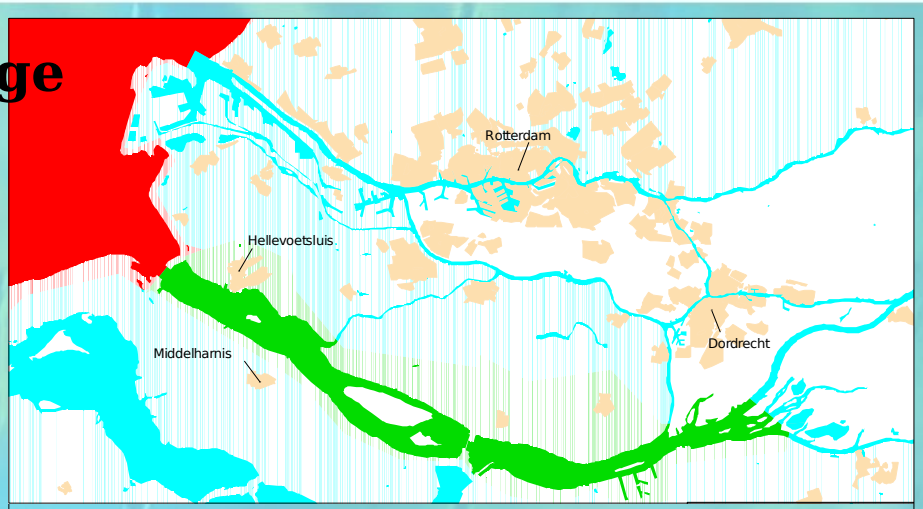
Salt gradient & Tidal range

Before 1970

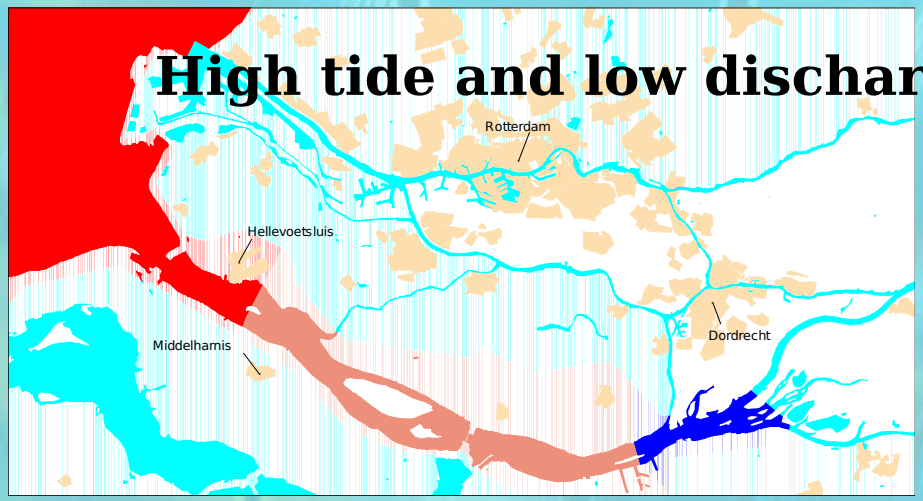
Present situation

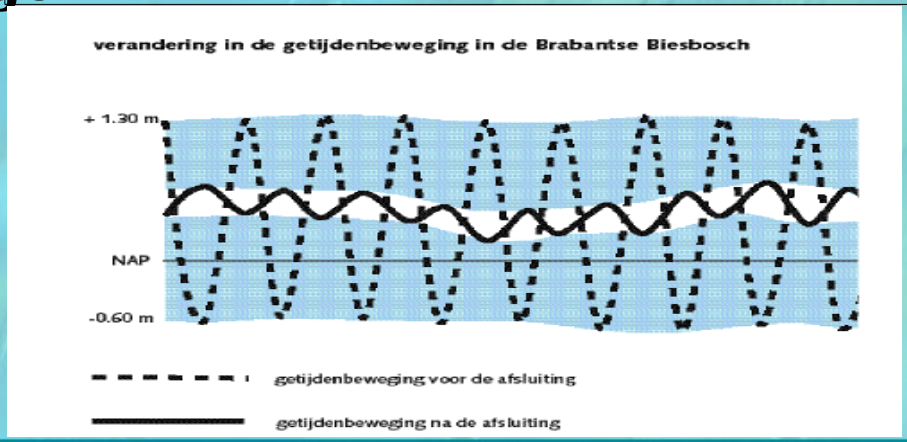
Low tide and high discharge





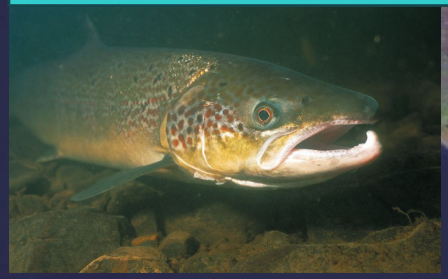
High tide and low discharge





Decline fish species

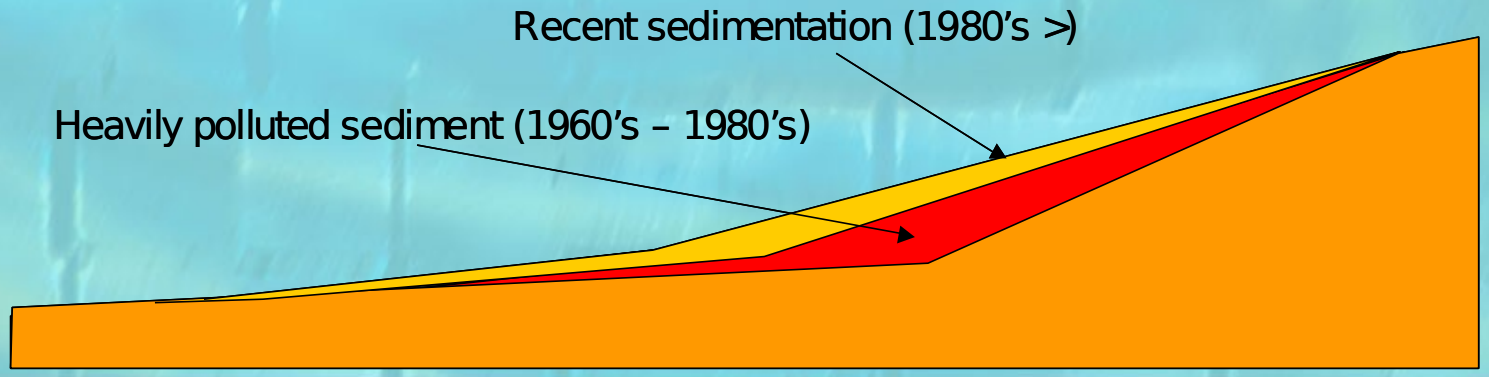
Number of species per ecological guild	Historical [estuary]	Present [lake]
Diadromous	12	9
Estuarine resident	20	1
Freshwater	27	38
Marine (juvenile)	16	0
Marine (seasonal)	20	1
TOTAL	95	49



Impacts of the Haringvliet dam

Large-scale sedimentation in former estuarine channels

Highly polluted sediments (heavy metals, PCB's, etc.) in 1960's to 1980's



Impacts of the Haringvliet dam

Foodweb: transition from pelagic to benthic production

risk of toxic compounds entering the food chain

reduced breeding success of top predators

Impacts of the Haringvliet dam

Longer residence time of water in the estuary:

algal blooms

oxygen deprivation

Impacts of the Haringvliet dam summary

Before

- tidal range 1.8 – 2.3 m.
- salt/brackish/fresh
- free fish migration
- mudflats and creeks
- reed beds rushes and willows

After

- tidal range 0.3 m.
- fresh water body
- fish migration disabled
- fresh water fish washed out
- bank erosion
- willows and nettles
- water for agriculture & drinking-water
- water recreation

Alternative management of the Haringvliet sluices

In line with the national “integrated water management policy” an Environmental Impact Assesment (EIA) was carried out from 1994 to 1998 aiming:

- to restore the natural transition between river and sea
- to ensure sustainable use of waters on both sides of the sluices
- no adverse effect on flood protection

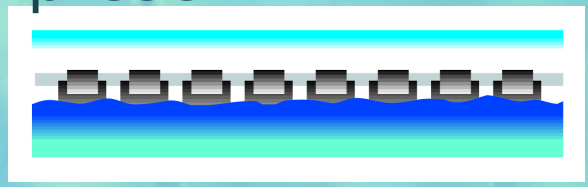
Conclusion EIA

1. For a sustainable rehabilitation of estuarine biota, the Storm Surge Barrier alternative would be best

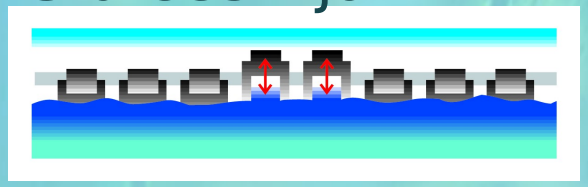
2. The negative effects of the alternative management regimes could all be offset by compensatory measures

3. Controlled tide the preferred option (best balance between cost and ecological benefits)

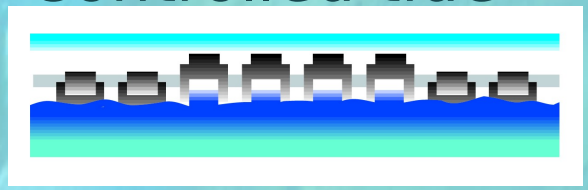
present



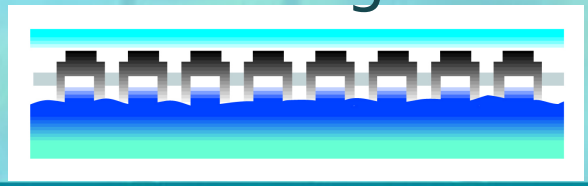
Sluices Ajar



Controlled tide



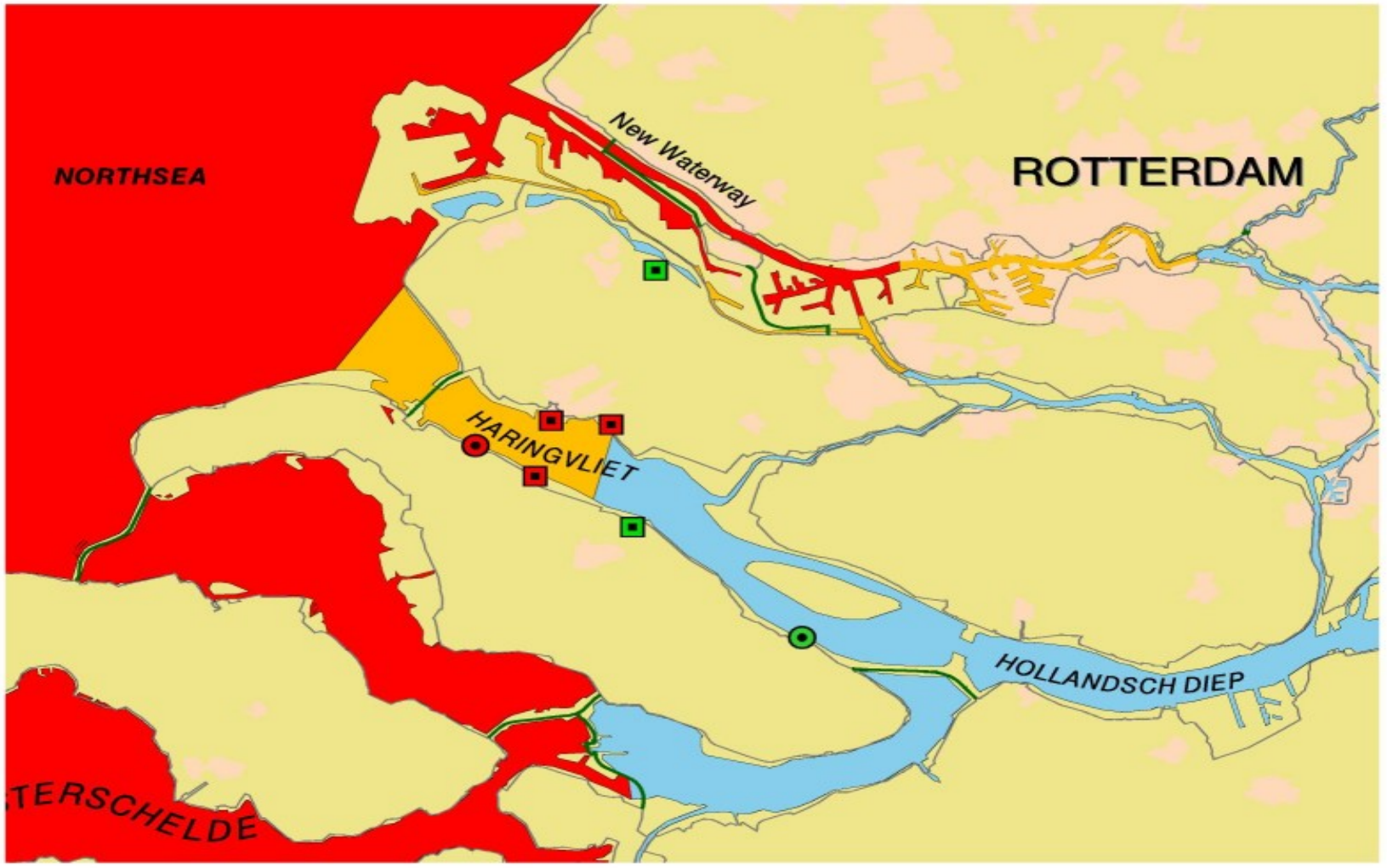
Storm Surge B.



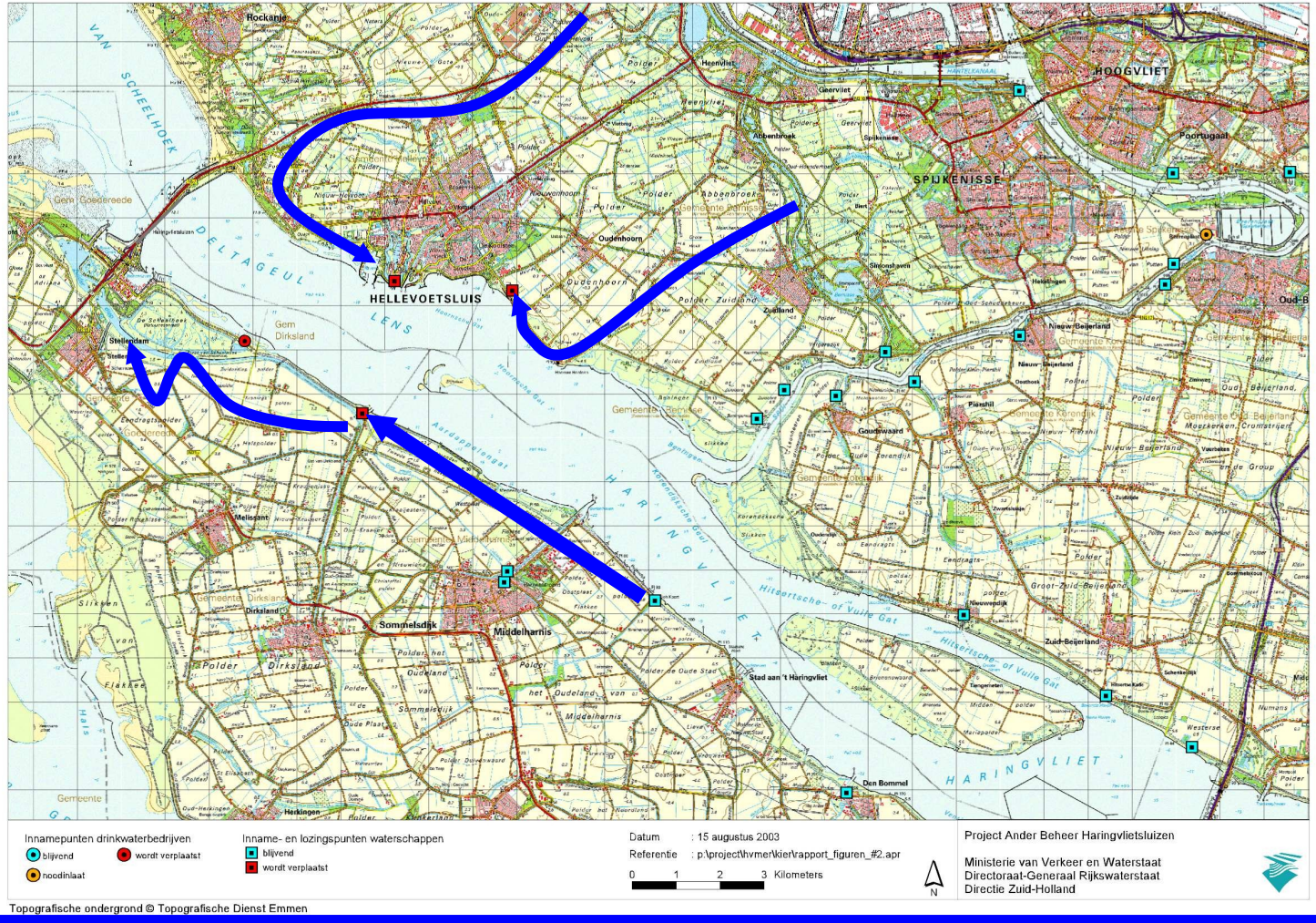
(c) RWS-ZH, Al

Fresh water intake point

‘Sluices Ajar’ in 2008!



Relocating water intake poin



‘Sluices Ajar’ a balancing act

Optimizing effect on ecology with maximum opening during flood and ebb periods

&

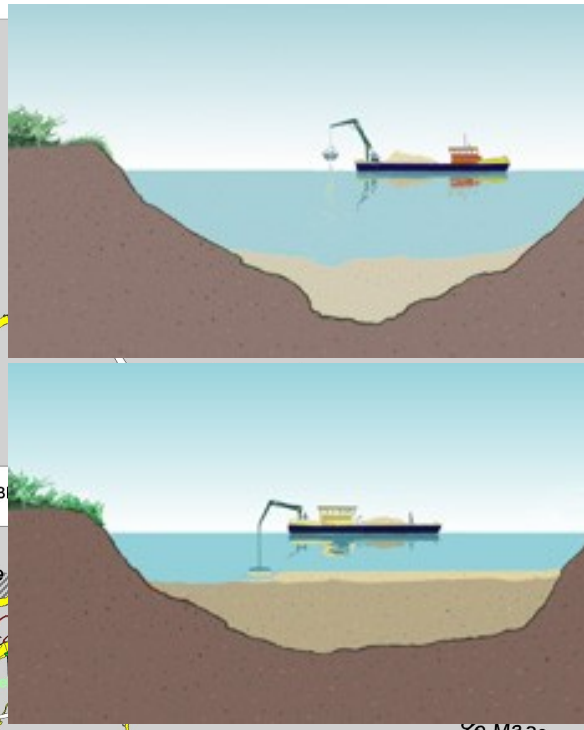
controlling salt intrusion and preventing significant effect on fresh water supply

… But there is more ….

- Further improvement of water quality (EU Water framework)
- Cleaning up polluted river beds (EU Water framework)
- Nature conservation & Wetland restoration (EU Nature 2000 & EU Water framework)

While …

- Keeping up with sea level rise and higher maximum river discharges
- Maintaining navigation to inland ports
- Facilitate (water) recreation



Cleaning up polluted river bed sediments

Stand van zaken waterbodemprojecten 2004

Datum : 30 maart 2004
Referentie : /export/data/arcdata/project/waterbodems/standvanzaken20

Waterbodem:
- Gesaneerd
- Vermoedelijk niet verontreinigd
- Verontreinigd
- Verontreinigd + urgentie tot saneren

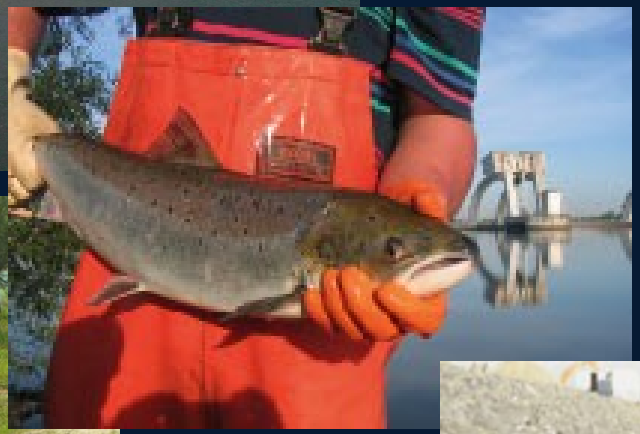
OROZ = orienterend onderzoek
NAOZ = nader onderzoek
SAOZ = saneringsonderzoek

0 4 8 12 Kilometer
Schaal (A3) 1 : 210.000

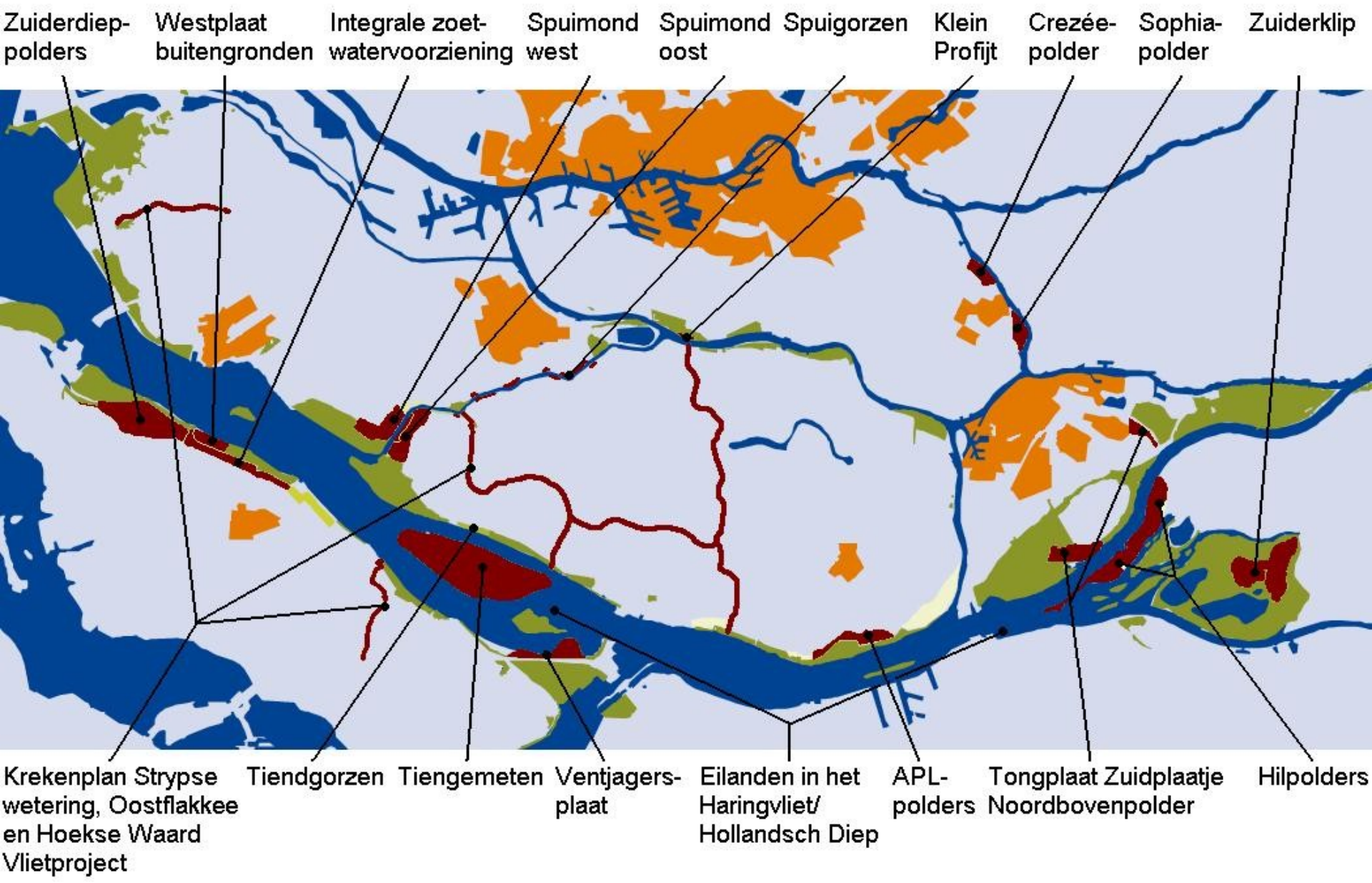
Rijkswaterstaat
Directie Zuid Holland
Watersysteemkennis

topografische ondergrond © Topografische Dienst Emmen

Vistrap bij Stuw Hagenstein



3500 ha's of wetland restoration



Grote karekiet

eendagsvlieg

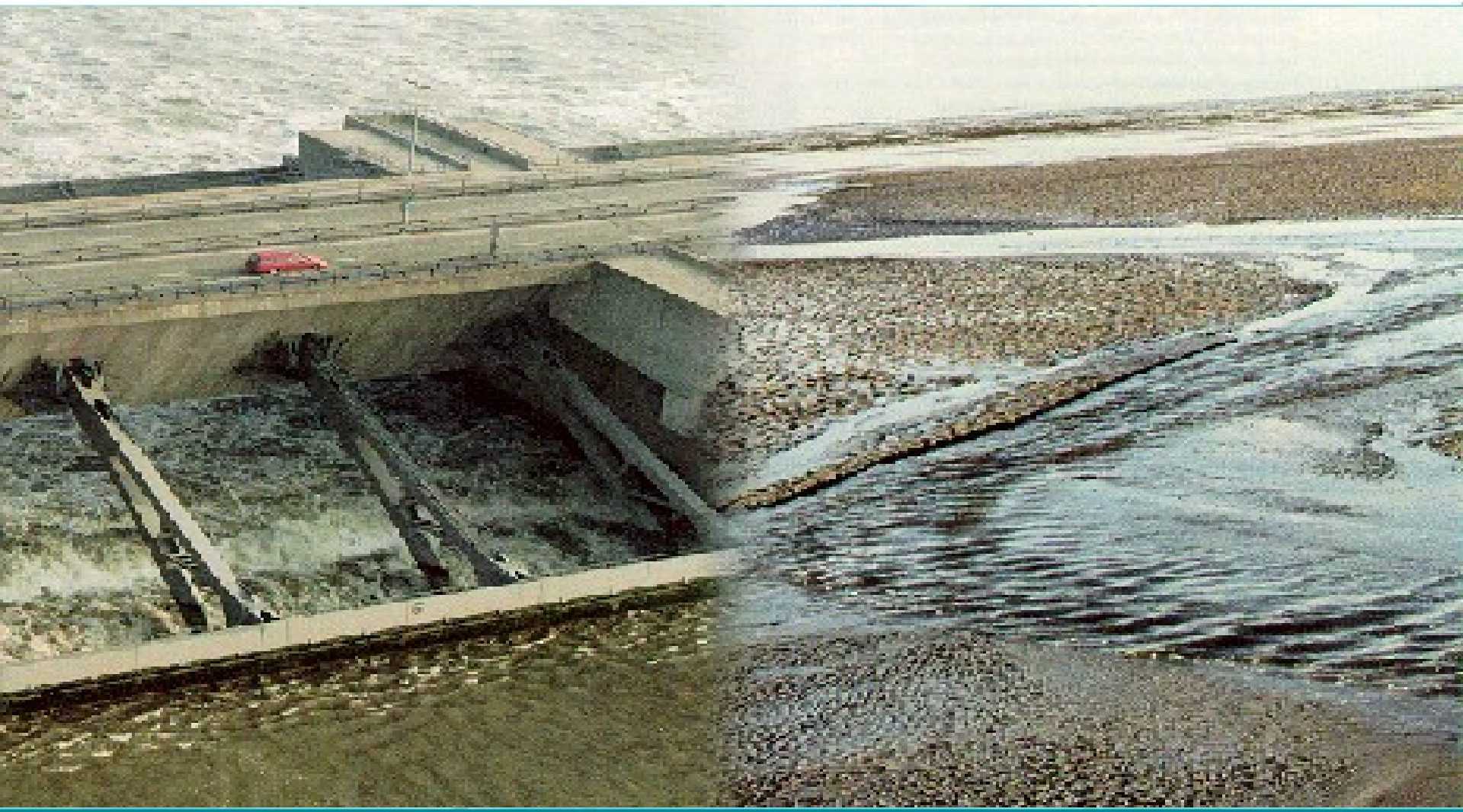
Noordse woelmuis

© 2001 Laurence Poh

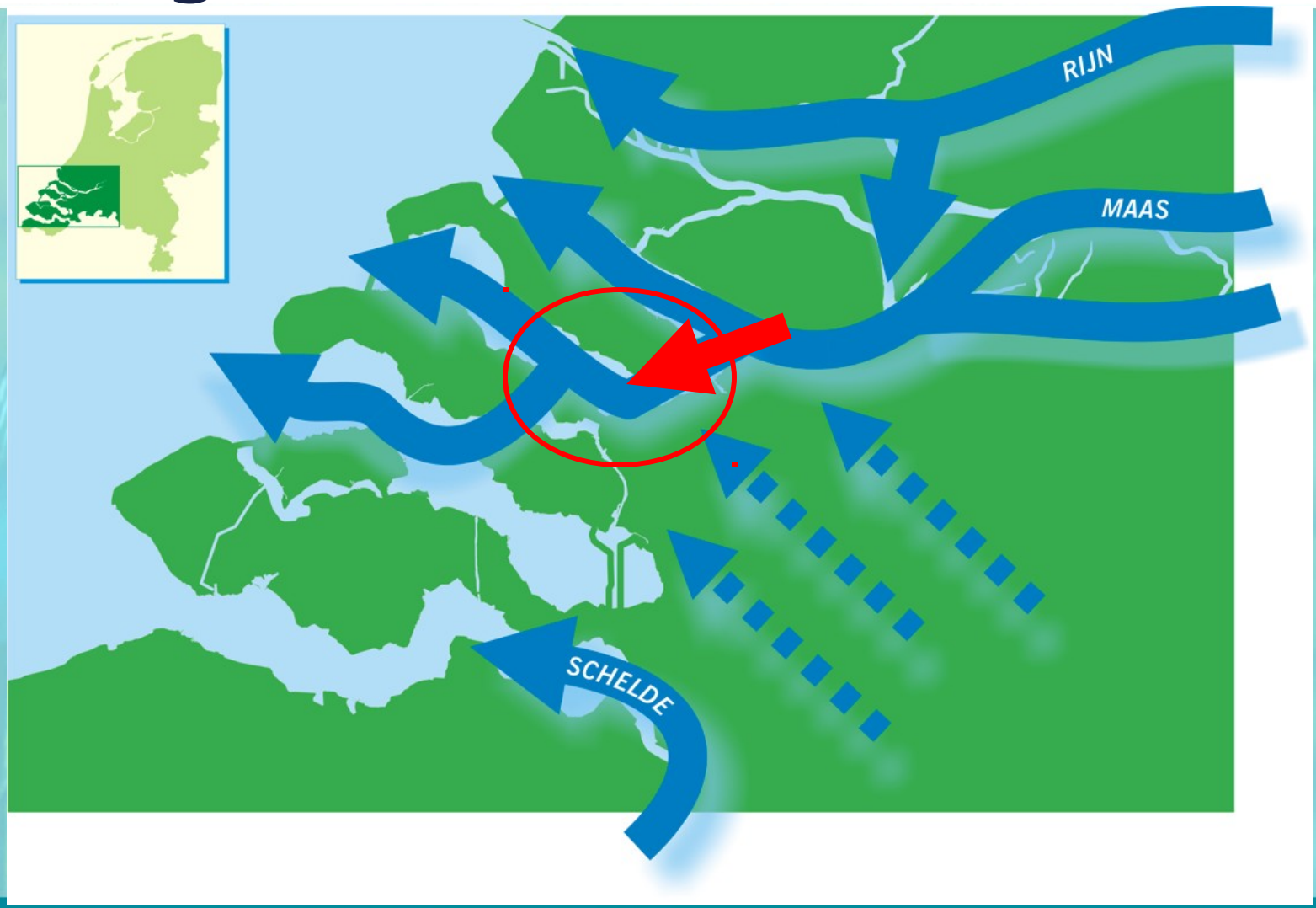
Conclusions

- influencing hydro & morphodynamics of an inlet/estuary has major implications
- after closure off the Haringvlietsluices large effort to mitigate adverse developments: shore protection, cleaning up river bed, wetland restoration and .....
- partial restoration estuarine gradient (sluices Ajar in 2008) and restoring the ecological continuum for migratory fish (EU Water Framework directive)
- it's more difficult to "set back" cultivation & occupation than to restore natural processes

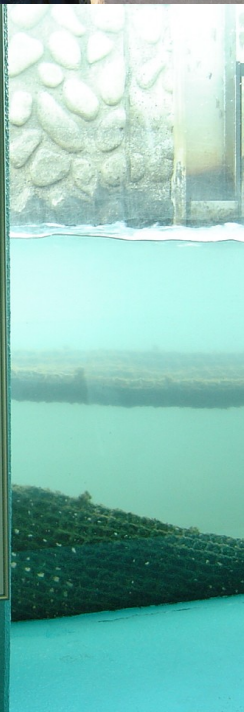
Thank you for your attention!

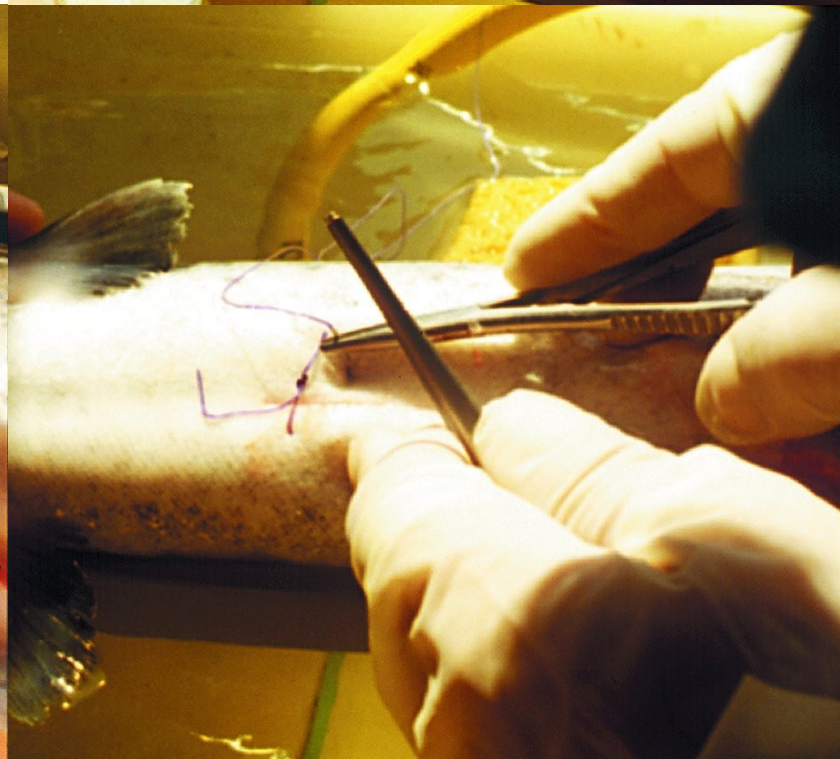


Facilitate larger river discharges



Nagara estuary barrage (Japan)





Monitoring migratory routes of